

Rebuttal Report of Dr. Michael Kavanaugh

In

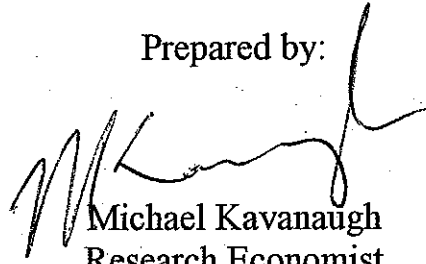
Enoch Adams et al.

v.

Teck Cominco Alaska Incorporated

Prepared For
Luke Cole
Attorney for the Plaintiffs

Prepared by:

A handwritten signature in black ink, appearing to read 'MK', is written over the printed name of Michael Kavanaugh.

Michael Kavanaugh
Research Economist
160 Wood Street
Batavia OH 45103
(513) 732-3939

January 10, 2005

I declare under penalty of perjury that the contents of this report
is true and correct to the best of my knowledge.

Rebuttal Report of Dr. Michael Kavanaugh

1. Summary

In my report of December 24, 2004 I estimated Teck Cominco's economic benefit for avoiding compliance with its total dissolved solids (TDS) limits at its Red Dog mine from June 1, 1999 to August 28, 2003. The benefit for avoiding compliance ranged from \$27.2 to \$30.8 million.¹ The range results from using either the equity method or a weighted-average cost of capital method to value the opportunity cost of the funds that Teck Cominco should have used to comply with its permit that allowed discharges to waters of the United States. In November 2004 one of defendant's witnesses, Mr. Robert Fuhrman, made a benefit estimate of \$100,000 for all of the claims in the Revised Complaint.²

The key analytic differences between the analyses underlying the economic benefit estimates made by the parties and likely to be offered to the Court are:

- Differences in the manner and cost of complying with the discharge permit (the compliance scenario); and
- Differences in valuing the opportunity costs of the avoided or delayed pollution control spending.

I defer to the opinion of plaintiffs' attorneys and plaintiffs' engineering experts on the appropriateness of the compliance scenarios offered by the defendant. Nevertheless, in Section 2, I make some observations on the appropriateness of the defendant's compliance scenario and record some differences between the scenario I used and the defendant's scenario. In general terms, defendant's estimate is based on its failure to get the discharge permit changed before production expanded or to spend sufficient funds to conduct tests, change practices or install and operate equipment. For example, in a most unusual compliance scenario for total dissolved solids (TDS), defendant's expert argues that the benefit arises

¹ "Expert Report of Dr. Michael Kavanaugh", December 24, 2004, Section 3.6.

² Fuhrman, Robert, "Analysis of Economic Benefit in Adams et al. v. Teck Cominco Alaska Incorporated," p.18.

because the company failed to get the discharge permit changed in 1998.³ In another compliance scenario defendant's witness asserts that no benefit is gained by the defendant for failing to control cyanide because the defendant expects the United States will change the requirement without the need of costly input from the defendant. Other compliance scenarios, ones that are more deferential to environmental law and regulation, form the basis for economic benefit estimates for whole effluent toxicity (WET), cadmium, total suspended solids (TSS) and monitoring and reporting.

A second reason for the difference in estimates of economic benefit is the valuation method. In section 3, I show that Defendant's method of valuation by excluding a return to risk:

- misconstrues the meaning of economic benefit;
- fails to implement EPA's policy on economic benefit;
- undermines the deterrent effect of penalties;
- results in an estimate that creates an incentive to pollute; and,
- is unfair to those who do comply with pollution control regulations.

In Section 4, I comment on aspects of the report of Mr. Gene Andrews, another witness for Tech Cominco. Specifically, I address Mr. Andrews's use of the term feasibility and his belief that 'Feasibility is determined by evaluation of economic and environmental benefits and project costs.'⁴

I reserve the right to modify and supplement my opinions as further information becomes available, including through deposition of defendant's experts, and to express new opinions in response to new information or to opinions expressed by defendant's experts. Additionally, I have not been given access to several of the reports and publications on which Mr. Fuhrman and Mr. Andrews relied in making their opinion. Plaintiffs' counsel informs me that these documents were requested of Teck Cominco but have not been provided to plaintiffs. I reserve the right to modify and supplement my opinions once I have been provided all data and publications on which defendant's witnesses relied.

³ Typically a benefit arises because of a failure to install and operate pollution control equipment.

⁴ Expert Report of Gene Andrews, p.7.

The fact that I have focused on certain statements in the reports of Mr. Fuhrman and Mr. Andrews does not reflect my acceptance or agreement with any of their statements that I did not address. Finally, in reviewing the Andrews report, a number of lines of text were printed on top of each other, making it sometimes impossible to read the lines. This includes, but is not limited to, lines on page 2 (paragraph 2), page 3 (paragraphs 3 and 4), page 4 (paragraph 13, 15, 16), page 9 (paragraphs V and VI), and page 12. I reserve the right to modify and supplement my opinions once these lines are provided to me in a legible form.

2. Compliance scenarios

In this section I make some observations on the differences between the compliance scenario that underlies my analysis with the one underlying the defendant's analysis.

Claim 1. In my analysis I assume -- on the advice of plaintiffs' engineering experts -- that the defendant's wastewater exceedences at its mine site result from inadequate capacity to treat the runoff from its waste pile(s) as well as wastewater generated from concentrate production. Wastewater production from these sources are a foreseeable consequence of profitable mine operations. The defendant planned the expansion of production.⁵ The defendant knew what the permit limits

⁵ The 1999 Annual Report of Cominco Ltd., declares:

- "With the Red Dog expansion completed, the mine's concentrator has achieved operating rates that are consistently above its design capacity." p. 13;
- "Economies of scale have been realized from the Production Rate Increase Project completed in September 1998," p. 14; and
- "Long-term sales contracts were concluded for Red Dog's Production Rate Increase, resulting in Cominco now supplying 25 different customers on four continents." p. 26.

The 1999 Annual Report of Teck tells shareholders that: "A 50% production rate expansion program was completed (at Red Dog) in 1998. As a result production was at a record 930,000 tons of zinc concentrate. Early in 2000 Cominco announced a program to lift capacity to 1 million tons."

In its 1996 Annual report at p.30, Teck told its shareholders that Cominco "Following the discovery of an adjacent orebody and a 70% increase in reserves at Red Dog, a decision was reached in 1996 to expand its output by 40%. The increased capacity will result in the annual production of 800,000 tons of zinc concentrate and 160,000 tons of lead concentrate, or the equivalent of one billion

were. What the defendant failed to do was expand its mine site wastewater treatment plant to accommodate its increased production capacity. This failure to expand wastewater treatment capacity is a source of economic benefit. I assumed -- on the advice of plaintiffs' engineering experts -- that a process of planning and effecting pollution control was needed. The specifics of the process the defendants avoided are: \$1 million for a feasibility study; \$5 million for an investigation; at least \$15 million for capital improvements and \$750,000 per year for operations and maintenance.

Defendant argues that the permit modifications obtained in August 2003 could have been sought in 1993 so that the permit modifications would have become effective in September 1998. If the permit modifications were effective in 1998, the argument goes, there would have been no TDS violations. Defendant estimates it spent \$217,000 to get the permit changed.⁶ Defendant's argument is that its benefit arises because it didn't spend the money (e.g., purchase legal services) soon enough.

This argument suggests an incautious regard for human health and the environment. It suggests that an appropriate response of a company expanding production capacity, increasing its earnings, and using the waters of the United States to deposit its waste is to seek a reduction in the level of protection afforded to human health and the environment.

Claims 2 through 10. My estimate of economic benefit is focussed on the exceedences listed in the Revised Complaint's first claim. In my report I made no estimate of benefit arising from any other claim in the Revised Complaint. For claims 2 through 10 defendants offer a variety of compliance scenarios. For a critique of these scenarios I defer to plaintiffs' attorneys and engineering experts.

3. Economic benefit

I use the established method to estimate economic benefit. The defendant does not. The key difference between the methods is the basis for the

pounds of contained zinc and 185 million pounds of contained lead. The project is scheduled for completion in late 1998 at a cost of US\$104 million."

⁶ Fuhrman, Table 1, p.18; Table 1.A provides additional detail on the spending. I have not been able to review these charges. It appears that in excess of \$60,000 is for legal fees.

present value factor. I construct the present value factor in one of two ways, either:

- An equity approach which uses the capital asset pricing model calibrated for a project of average risk and combines a risk free rate plus a risk premium resulting in a factor of 13.4%; or,
- A weighted-average cost of capital approach which adjusts the equity result for the after-tax cost of debt. The adjustment reflects the company's proportions of debt and equity. It results in a factor of 11.1%.

Defendant's witness constructs a present value factor based only on a tax-adjusted, risk free rate. The rates varies monthly but when annualized ranges from less than 1% to just over 2.5%.⁷

The present value factor implements the common sense economic principle that a dollar today is worth more than a dollar tomorrow. It is a scale that states by how much a present dollar is expected to exceed a future dollar. This depends on the company's earning opportunities from its business resources. I estimate the earning opportunities for Teck Cominco in the range of 11.1% to 13.4%. Defendant estimates the range from less than 1% to just over 2.5%

USEPA's policy, USEPA's guidance on economic benefit, judicial opinion and the principles of economics and finance inform the following opinions about defendant's method of valuation. Because it omits an expected return to risk it:

- misconstrues the meaning of economic benefit;
- fails to implement EPA's policy on economic benefit;
- undermines the deterrent effect of penalties;
- results in an estimate that creates an incentive to pollute; and,
- is unfair to those who do comply with pollution control regulations.

⁷ Fuhrman, Table 1.E, Column headed "Interest forward Factor to PPD" annualized using the formula: $r = v^{(1/t)} - 1$ where r is annual rate, v is the interest forward value in the table, t is the time in years to PPD, the penalty payment date.

3.1 The meaning of economic benefit

From the outset to the present enforcement of the Clean Water Act is based on the concept that firms should not be allowed to gain from non-compliance.⁸ The following guidance on the subject dates from 1980.

"Delaying the purchase and operation of pollution control equipment results in economic savings or gains to the owner or operator of a facility. These savings or gains arise from two distinct sources: The opportunity to invest capital funds not spent to purchase and install pollution control equipment during the period of noncompliance, and the avoidance of the operation and maintenance expenses associated with the pollution control equipment during the period of delayed compliance (labor, materials, energy). These costs avoided represent permanent savings to the owner or operator; they may, of course, also be invested in income-producing ways. The economic benefits attributable to delaying capital expenditures and avoiding operation and maintenance expenses have been combined in a single formula. Because these benefits occur over a period of time, both past and future in some cases, the formula reduces these benefits to a present dollar value."⁹

In the mid-1990s the trial judge wrote in *Friends of the Earth et al. v. Laidlaw*¹⁰

⁸ Economic benefit is not compensation to the public for the use of its water nor is economic benefit a damage calculation as in a typical tort case. Economic benefit is the amount to extract from the defendant to leave it in the same financial position it would have been in had it complied on time. BEN Users Manual, USEPA, September 1999, p.1-2.

⁹ 'EPA Penalty Policy', 1980, p.11.

¹⁰ 890 F. Supp. 470, 481-82 (D.S.C. 1995). The Laidlaw case had a complicated procedural history; after plaintiffs prevailed below, 956 F. Supp. 588 (D.S.C. 1997), the case was vacated by the Fourth Circuit on standing grounds, 149 F.3d 303 (4th Cir. 1998) and ultimately reinstated and remanded by the U.S. Supreme Court, 528 U.S. 167 (2000).

The defendant, as a holder of an NPDES permit, should not profit from non-compliance with that permit. If DHEC (Department of Health and Environmental Compliance) assessed a penalty that was below the Defendant's economic benefit of non-compliance, DHEC would not have penalized the Defendant at all; instead, the Defendant would have been rewarded for noncompliance with its permit.

Economic benefit is the after-tax present value of avoided and delayed expenditures on necessary pollution control measures. Economic benefit represents the opportunity a polluter had to earn a return on funds that should have been spent to purchase operate and maintain appropriate pollution control devices....

Present-value analysis of economic benefit allows one to express all cash flows as of given date by accounting for the fact that a dollar today is worth more than a dollar tomorrow. To determine by how much the value of a dollar of one year exceeds the value of a dollar of another year, one must use a discount rate to calculate the present value of money from the various time periods. The discount rate, or opportunity cost, represents the return the Defendant had the opportunity to obtain by investing the funds it delayed or avoided spending on pollution control measures. This rate can be used to move dollars through time and determine the Defendant's economic benefit as of a given date.

The court adopts the capital asset pricing model as the appropriate method for determining the benefit of non-compliance. Under the capital asset pricing model, the discount rate is computed using a risk-free component which is based on short-term United States Treasury Bills, and a near-constant risk premium. Using the capital asset pricing model, Dr. Michael Kavanaugh, the Plaintiffs' economic expert determined that the appropriate discount rate for this case is 15.25%. [Footnote omitted]

The latest USEPA guidance on economic benefit states:

'Economic benefit represents the financial gains that a violator accrues by delaying or avoiding pollution control expenditures.

Funds not spent on environmental compliance are available for other profit-making activities, or, alternatively a defendant avoids the costs associated with obtaining additional funds for environmental compliance. (This concept is known in economics as opportunity cost.) Economic benefit calculates the amount by which a defendant is financially better off from not having complied with environmental requirements in a timely manner. Economic benefit is "no fault" in nature. A defendant need not have deliberately chosen to delay compliance (for financial or any other reason), or in fact even been aware of its noncompliance, for it to have accrued the economic benefit of non-compliance.

The appropriate economic benefit calculation should represent the amount of money that would make the violator indifferent between compliance and non-compliance".¹¹

An economic benefit analysis must make an informed estimate of the amount expected to be earned on the avoided funds. This is done by using established economic constructs such as the capital asset pricing model or weighted-average cost of capital and if available by the defendant's own expectations of earnings.

For example, Cominco's 1999 Annual report states a financial goal as "... earn[ing] our cost of capital even at the bottom of the metal cycle." (p.8). In reference to Red Dog, the Annual Report in its highlights section declares that 'Red dog achieved a rate of return on capital employed of 15% even though metal prices were relatively low throughout much of the year. This rate of return exceeded the company's estimated cost of capital of 10%.' (p.5)

For profit firms--like the defendants-- are designed to bear risk. To be consistent with removing the gain from avoiding pollution control spending; to make the violator indifferent between compliance and non-compliance; and, to be consistent with twenty-five years of policy,

¹¹ Ben User's manual, USEPA, September 1999, p.1-2.

guidance and opinion, an economic benefit estimate must reflect the earnings from risk bearing.¹²

Management must bear risk. If a company's management does not bear risk another management group will come along and take over the firm. I think bearing an average level of risk is sufficient to deter take-over. Accordingly, a firm will invest in projects that exhibit risk and should have its economic benefit calculated using opportunity costs that reflect average risk. Defendant's estimate excludes an expected return to risk. Accordingly, it does not measure economic benefit and is contrary to EPA policy and guidance.

3.2 Incentives and Deterrence

Removing economic benefit helps to ensure that members of the regulated community have a strong economic incentive to comply with environmental law.¹³ Suppose a firm avoids pollution control, invests the avoided funds, is caught, and is penalized. If the penalty is based only on the risk-free return as defendant's witness would have it, and the firm invested in risky projects -- the normal and expected behavior of a for-profit firm-- the economic benefit has not been removed. The firm earned a risk-free rate plus a risk premium rate but was only penalized at the risk-free rate. The firm retains the risk premium and an incentive to pollute is created.

Moreover, failure to remove economic benefit undermines the goal of deterring future noncompliance. Other companies are subject to Clean Water Act regulations.¹⁴ When they see that one of their competitors has avoided pollution control and has been permitted to keep the risk premium from investing the funds that should have been spent on pollution control, then these other companies will see an economic advantage in similar noncompliance.

¹² It has been long acknowledged that if a violator can achieve compliance by reducing production volume then it is incumbent that it do so. Reduction in production volume reduces the firm's total return not just the risk-free return.

¹³ Ben User's Manual, USEPA, September 1999, p 1-1.

¹⁴ The USGS Minerals Yearbook -2002 discloses 11 active zinc mines in 5 states (See Zinc section p.1). Table 3 of the yearbook shows the 9 largest U.S. mines.

3.3 Equity

Those firms who do comply with environmental law and regulation are treated unfairly if the economic benefit from noncompliance is not removed from firms that violate the law. Firms (e.g., zinc mines) who comply with the Clean Water Act and its implementing regulations must use scarce resources to manage and treat contaminated waters that are produced as a consequence of their actions. These funds could be used in other projects that on average have a return that reflects risk bearing. Allowing a competitor to delay compliance and keep part of the earnings on the funds that should have been spent for compliance provides the non-complying firm with a financial advantage over its competitors. This is unfair to the law-abiding competitors.¹⁵

4.0 Feasibility

Mr. Andrews, one of defendant's witnesses, defines feasibility as an evaluation of economic and environmental benefits and project costs. This is a troubling statement for two reasons. First, Congress delegated authority for setting discharge limits to the Environmental Protection

¹⁵ The U.S. Congress has endorsed this sentiment on at least two occasions. During the 95th Congress in Senate Report 370, 70. "The conferees deleted a provision in the Senate-passed bill which required the Administrator to assess a noncompliance fee. The fee was seen as unnecessary because **(EPA) policy embodies congressional intent on the criteria that should be considered by courts in imposing civil penalties under existing provisions of the act** (emphasis added)." (Note: EPA policy calls for removing all of the gain not just the risk-free gain from non-compliance)(note added).

During the 99th Congress in 1985 Mr. DOLE (for Mr. CHAFEE) submitted the following: "The amendment would also expressly require the courts to consider a number of factors, including, in particular, the economic benefit gained as a result of the violation. Violators should not be able to obtain an economic advantage vis-a-vis their competitors due to their noncompliance with environmental laws. The determination of economic benefit or other factors will not require an elaborate or burdensome evidentiary showing. Reasonable approximations of economic benefit will suffice. Other objective factors customarily taken into account in assessing penalties, such as the history of violations, good faith efforts to comply and economic impact on the violator, also may be taken into account in arriving at an appropriate penalty." Committee on Environmental and Public Works 99th Congress Senate Report 50, 25

Agency not the permit holders, and Congress has declined the opportunity to require a cost benefit test in setting discharge limits. Second, feasibility means capable of being done. The defendant proceeded with the Production Rate Increase Project and expanded production. If the project was feasible only if discharges were not controlled and the permits limits were consistently exceeded then the defendant expanded production prematurely and obtained sales revenues sooner than it should have. In other words it gained an economic benefit from early production. This benefit may be materially greater than the benefit from avoiding a process of planning and effecting pollution control.

4.1 Technology based standards

The Clean Water Act relies on technology based controls to protect human health and the environment. The statute directs the Environmental Protection Agency to control discharges to the water of the United States using the best available technology taking into account the cost of achieving effluent reduction (i.e. cleaner water). This directive to consider the cost of achieving cleaner water is an instruction to perform cost-effectiveness analysis. That is, it is a directive to answer the question 'How much does it cost to remove contamination?' It is not a directive to answer questions about environmental benefits such as: 'Is removing the contamination worth it to human health and the environment?'

Since its passage in 1972, The Clean Water Act has been repeatedly subject to reauthorization. During reauthorization Congress has declined repeatedly to require a cost benefit analysis when setting standards to control water pollution. I believe the reason for this is simple. The benefits of protecting human health and the environment, though real, are very difficult to value in dollar terms. Simply suggesting that there might be a dollar value (or even a range of dollar values) to a human life is a good way to enter into a very emotional argument. Estimating the cost of a pollution control is much easier by comparison. Given the mismatch in our analytical abilities to determine relative cost and benefits in dollar terms, Congress has simply refused to order that it be done.

4.2 Feasibility

A project (like the defendant's Production Rate Increase Project) is economically feasible if it is capable of being done. In a market economy a project is capable of being done if over the life of the project it can return an excess of revenues over costs. In other words, a project is feasible if consumers are willing to pay what it costs to produce the product. Economic feasibility, then, is a broadly focussed measure of the performance of the entire project (not just the pollution control part or just the marketing part, or the mining part) from the point of view of the firm.¹⁶

A feasible project may have several parts. One or more of the parts may be expensive. By itself this not enough to make the project economically infeasible. The project remains feasible if it produces a positive net present value. Ultimately in a market economy it is the consumer who determines economic feasibility.

A demonstration of economic feasibility needs a calculation that includes not only the costs of production including the costs of controlling discharges, but also consumers' willingness to pay. Consumers of products (in this instance zinc concentrate) whose production contaminates the water may be willing to pay the full costs of production including the costs of water pollution controls. Mr. Andrews's analysis of feasibility on p.10 of his report does not consider the willingness of consumers to pay for controls and in so doing omits key evidence. On the face of it, the feasibility of the Production Rate Increase project with and without pollution controls cannot be determined from Mr. Andrews's analysis.

In the alternative,

- since the defendant had to comply with the terms of its permit to use the waters of the United States; and,

¹⁶ More formally, economic feasibility considers all of the project's revenues over time, discounted to present value, and adjusted for taxes compared to all of the project's costs over time also discounted to present value and adjusted for taxes. If the after-tax present value of the revenues exceed the after-tax present value of the costs then the project is feasible

- if the defendant's Product Rate Increase project was feasible only if discharges were not controlled to the limits of its discharge permit as Mr. Andrews seems to suggest;
- then the defendant expanded production prematurely; and in so doing,
- gained the use of revenues sooner than it would have had it waited until it could control discharges to the limits of its permit.

In other words it gained an economic benefit by having the use of the revenues from early production.¹⁷

Sources Considered

Expert Report of Robert Fuhrman.
Expert Report of Gene Andrews.
1999 Annual Reports of Cominco Ltd.
1997 - 1999 Annual Report of Teck, Inc.
BEN Users Manual, USEPA, September 1999.
EPA Penalty Policy, 1980.
USGS Minerals Yearbook -2002.
Senate Report 370, 70, 95th Congress.
Senate Report 50, 25, 99th Congress, Committee on Environmental and Public Works.
890 F. Supp. 470, 481-82 (D.S.C. 1995).
956 F. Supp. 588 (D.S.C. 1997).
149 F.3d 303 (4th Cir. 1998).
528 U.S. 167 (2000).
Annual Reports of Teck Cominco Alaska Incorporated 1999 to 2003.

¹⁷ If Teck Cominco had to curtail operations completely to comply with its permit from June 1999 to August 2003, I estimate it gained a \$69 million benefit from early receipt of the operating cash flow from its Red Dog operations. Complete curtailment of its operations at Red Dog, however, may not have been needed for compliance. In that event, the \$69 million estimate is an overestimate of the benefit from early production. If, for example, a 50% reduction in output would achieve compliance then the benefit is about \$34.5 million. These estimates are based on operating cash flows reported in Teck Cominco Alaska Incorporated's financial reports 1999 to 2003, Teck Cominco's weighted-average cost of capital, and linearity in production and cost.